SMD Operations Procedures Manual

8.1.1.38 OPERATION OF THE NGC LONG COIL CURING /COLLARING PRESS

Text Pages 1 through 51
Attachment(s) 1-10

Hand Processed Changes

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1 Purpose and scope

1.1 To provide instruction in the operation of the long coil curing press located in building 924.

2 Responsibilities

2.1 Authorized operators of the press shall perform the tasks described here. A list of operators is maintained by the coil fabrication plant manager:

2.1.1 The authorized operator shall operate the controls of the press.

2.1.2 The authorized operator shall test the Emergency Stop systems every six months.

2.2 The operator shall read and complete the following documentation:

2.2.1 Daily log book for coil programs. Entries shall include any information that the operator deems important to pass along to the coil fabrication supervisor, the Cognizant Engineer, or the next work shift, including:

- Work accomplished regarding coil production.
- Coil discrepancies.
- Repairs to the press (brief description).
- Lessons learned.
- Irregularities during operation of the press.

2.2.2 Maintenance log. Entries shall include.

- Each repair and maintenance procedure.
- Parts and material used.

2.2.3 Traveler associated with the coil being cured.

2.2.4 Manually Operated Valve (MOV) Checklist (Attachment 7)

2.2.5 Emergency Stop Test Form (Attachment 8).

3 Prerequisites

3.1 Training

3.1.1 Operators shall be trained by the coil winding/curing technician supervisor before using this procedure.

3.1.2 Operator shall be trained as an "knowledgeable employee" as defined by BNL ES&H Standard 1.5.1, "Lockout/Tagout Requirements."

3.1.3 Specific steps of this procedure contain Electrical & Mechanical Assembly operations that impact the environment. Prior to performing these steps, personnel shall complete the applicable facility specific environmental training.

3.2 Equipment

3.2.1 Safety glasses with side shields, or goggles.

3.2.2 Hot Oil Suits

4 Precautions

4.1 Verify that all guards and shields are in place.

4.2 Verify that work area within the yellow border is clear of unauthorized personnel.

4.3 Wear eye protection.

4.4 Do not wear loose clothing or hanging jewelry. Keep long hair tied up.

4.5 Do not enter NGC Pump /Heater Room during the curing cycle without Hot Oil Suits.

4.6 The safety interlocks shall be tested every six months. A dated "Emergency Stop Test Form" (Attachment 8) shall be posted near the press and used for verification.

4.7 To avoid errors when setting the Manually Operated Valves (MOV), use the MOV checklist (Attachment 7).

5 Procedure

5.1 Overview Of The NGC Long Coil Curing /Collaring Press

5.1.1 The NGC (after its original supplier, Northrop Grumman Corporation) Long Coil Curing /Collaring Press provides a means (during separate operations) of curing and collaring coils. Individual curing and collaring transfer beds allow for the movement of assemblies into and out of the single curing /collaring press.

5.1.2 *Curing:* The superconducting cable insulation system is coated with a thermoplastic adhesive. The Press provides a means of activating the thermoplastic adhesive while holding the wound coil in the required shape. The Press applies heat and pressure to the coil in timed cycles under computer control, while the coil lays in a formblock. The result is a rigid coil pack which will produce the required magnetic field shape when excited.

5.1.3 *Collaring:* The collared coil assembly consists of matched coil sets and a beam tube encased by a set of upper and lower yokes. The press uses high pressure under computer control to compress the upper and lower yokes together, allowing for the insertion of keys. These keys hold the assembly in the compressed state, maintaining a rigid alignment of all parts prior to being welded into shells.

5.1.4 The heat, pressure, and cycle times, will vary with the type of coil being cured. Refer to specific MAP for details.

5.1.5 Control of the Press is through a computer running a custom Windows-based program.

5.2 Operator Controls

5.2.1 PATHEX Panel - Upper

5.2.1.1 Alarm /Reset: Resets alarm.

5.2.1.2 Allen-Bradley Panel: Accepts input of Process & Recipe numbers and allows the parameters of programs to be changed.

5.2.1.3 Numeric Keys Lock (ON/OFF): Locks out numeric portion of Allen-Bradley keypad from operating (remainder of keypad will remain functional).

5.2.1.4 Zone & Mode Selector (LOCK/ENABLE): Locks out zone and mode selectors from operation.

5.2.1.5 Operator Control (LOCK/ENABLE): Locks out the lower control panel of the PATHEX from operation.

5.2.1.6 Press Zone #1/#2/#3/#4 Selector: Allows use of some /all hydraulic cylinders depending on the length of press that needs to be utilized. This is dependent on the overall length of the coil. Refer to specific MAP for details.

NOTE

The following (8) controls function on the hydraulic system of the press only. They do not control the heating oil circuits (the "HEAT" system).

5.2.1.7 Hyd Oil Circ Start: Energizes hydraulic cooling oil circuit.

5.2.1.8 Hyd Low Pressure Start: Energizes low pressure hydraulic circuit.

5.2.1.9 Hyd High Pressure Start: Energizes high pressure hydraulic circuit.

5.2.1.10 Hyd End Pusher Start: Energizes end pusher hydraulic circuit.

5.2.1.11 Hyd Oil Circ Stop: De-energizes hydraulic cooling oil circuit.

5.2.1.12 Hyd Low Pressure Stop: De-energizes low pressure hydraulic circuit.

5.2.1.13 Hyd High Pressure Stop: De-energizes pressure hydraulic circuit.

5.2.1.14 Hyd End Pusher Stop: De-energizes end pusher hydraulic circuit.

5.2.1.15 Collaring Mode: Selects collaring mode.

5.2.1.16 Curing Mode: Selects curing mode.

5.2.1.17 Control Power On: Power control for the upper and lower PATHEX control panels.

5.2.2 PATHEX Panel - Lower

5.2.2.1 Load Collaring Tool: Moves collaring bed into press.

5.2.2.2 Unload Collaring Tool: Moves collaring bed out of press.

5.2.2.3 Begin Collaring Process: Begins selected collaring program.

5.2.2.4 Continue Collaring Process: Resume collaring program after an interruption.

5.2.2.5 Press Load Mode: Activates bed motor in preparation for movement.

5.2.2.6 Second Hand: Used simultaneously with all control buttons to prevent inadvertent selection of a command.

5.2.2.7 Press Jog Mode: Initiates jog hydraulic system.

5.2.2.8 Press Manual: Sets press for manual operation.

5.2.2.9 Press Automatic: Sets press for automatic operation.

5.2.2.10 Open Press: Lowers the lower platen of the press.

5.2.2.11 Close Press: Raises the lower platen of the press.

5.2.2.12 Press Press Mode: Used to start a Press program.

5.2.2.13 End Pusher In: Applies end load to coil in press.

5.2.2.14 End Pusher Out: Disengages end load to coil in press.

5.2.2.15 Load Curing Tool: Moves curing bed into press.

5.2.2.16 Unload Curing Tool: Moves curing bed out of press.

5.2.2.17 Begin Curing Process: Begins selected curing program.

5.2.2.18 Continue Curing Process: Resume curing program after an interruption.

5.2.2.19 Emergency Stop: Shuts down Boilers /Pumps /Table Motors.

5.2.3 Honeywell Panel - Heating Control ("HEAT" System)

NOTE

The Honeywell panel is located above the upper PATHEX panel

5.2.3.1 Panel Alarm: Shows location within press which is causing alarm.

5.2.3.2 Power On light: Indicates power is on to the panel.

5.2.3.3 Heat (Off/On): Two identical switches provide control of the heaters.

5.2.3.4 TIC-1 Panel: Display of tooling average temperature and tooling set temperature.

5.2.3.5 TIC-2 Panel: Display of heating oil average temperature and heating oil set temperature.

5.2.3.6 Water Cooler On Light: Indicates water cooler is on.

5.2.3.7 Air Cooler On Light: Indicates air cooler is on.

5.2.3.8 E-Stop: Shuts down pumps and heaters.

5.2.3.9 Start: Turns on circulating pump (after HEAT boilers are activated from NGC Pump /Heater Room).

5.2.3.10 Stop: Stops circulating pump.

5.2.3.11 Siren: Provides audible warning of an alarm condition.

5.2.3.12 Acknowledge: Press to silence alarm.

5.2.4 AMTEX Computer

5.2.4.1 Desktop screen, keyboard & CPU which collect data for selected process.

5.2.5 Dipole "HEAT" Control Panel (In NGC Pump /Heater Room)

5.2.5.1 (3) Three phase ampmeters

5.2.5.2 Power On Light: Indicates system has been energized.

5.2.5.3 E-Stop: Emergency shutdown.

5.2.5.4 Reset: Re-energizes system after a shutdown. Also used to energize system after ON/OFF switch has been set to "ON".

5.2.5.5 Reset: Re-energizes system after a shutdown. Also used to energize system after ON/OFF switch has been set to "ON".

5.2.5.6 On/Off Switch: Supplies 480 Volts to Dipole Oil Heater system. RESET LOCK /OFF /TRIP /ON positions (must be reset if power is tripped).

5.2.6 Power Controls (Outside Oil /Air Heat Exchanger Area)

5.2.6.1 There are two heat exchanger units in the Oil /Air Heat Exchanger Area. Each unit contains (2) Power On/Off switches which control supply of power to the cooling fans.

5.3 Curing - System Start Up

5.3.1 Open Oil Valves MOV-J (located on the return line at the non-lead end of mandrel), MOV-I (main return located near the floor of the press table) and MOV-H (main supply located near the floor of the press table).

NOTE

If leakage is detected from the mandrel quick disconnects (located on its end), the oil shall be cleaned up immediately & disposed of as regulated industrial waste.

5.3.2 Verify that all other Manually Operated Valves are in the proper positions as per the Manually Operated Valve Checklist (Attachment 7). Check off each valve on the Check List and place the list in the daily log book.

5.4 Curing - Initial Configuration of PATHEX Control Panel

5.4.1 Set (3) key switches to positions as noted below:

- NUMERIC KEYS LOCK to "OFF"
- ZONE & MODE SELECTOR to "ENABLE"
- OPERATOR CONTROL to "ENABLE"

5.4.2 Pull emergency stop up. The light on button should be off.

5.4.3 Power up PATHEX Control Panel by pressing "CONTROL POWER ON BUTTON". Light on button should illuminate.

5.4.4 Press "PRESS ZONE #xx SELECTOR" Button as indicated in MAP (appropriate for the length of the coil being cured). Button should illuminate.

5.4.5 Press "F1" on keypad until "Set Up Menu" appears.

5.4.6 Press "F2" on keypad, "Process #" should appear.

5.4.7 Press the number "1" on the keypad (process 1 is for curing).

5.4.8 Press "ENTER" on the keypad. The screen should now read "Process #1".

5.4.9 Press "CURING MODE" button. The button should illuminate. If button flashes, stop work and notify supervisor.

5.4.10 Press "F2" on the keypad. "Recipe #" should appear.

5.4.11 On the keypad, press the number for the appropriate recipe per the Magnet Assembly Procedure.

5.4.12 Press "ENTER" on the keypad. Screen should display the recipe # selected.

5.4.13 Press the following buttons on the panel:

A) "HYD OIL CIRC START"
B) "HYD LOW PRESSURE START"
C) "HYD HIGH PRESSURE START"
D) "HYD END PUSHER START"

NOTE

Lights will be steady or flashing

5.4.14 Press and hold the "SECOND HAND" button down, then press the "PRESS LOAD" mode button. The light on "PRESS LOAD MODE" should illuminate.

5.5 Curing - Loading Formblock

NOTE

Before loading formblock, ensure that (16) LVDT blocks and (4) Stop Blocks are removed.

5.5.1 Press and hold the "SECOND HAND" button down, then press the "PRESS AUTOMATIC MODE" button. Button should flash.

CAUTION

Pinch Hazard. Be sure that the curing press table and platen are clear of personnel. To prevent unexpected movement and potential personnel injury, the following order is important

5.5.2 Press table drive reset button (located in Dipole Press Controller Cabinet).

5.5.3 Press and hold the "SECOND HAND" button, then press the "LOAD CURING TOOL" button. "LOAD CURING TOOL" button should flash until the formblock has been completely loaded into the press. When the light illuminates solidly, the tool is fully loaded.

5.5.4 Verify shims are still centered at top of formblock flats. Adjust if required.

5.6 Curing - Jogging Platen

5.6.1 Press and hold the "SECOND HAND" button down, then press the "PRESS JOG MODE" button. The button should illuminate.

NOTE

"AUTOMATIC MODE" button should be lit. If not, perform the following steps:

A) Press & hold "SECOND HAND BUTTON" down.
B) Press "AUTOMATIC MODE" button. Button will illuminate.

5.6.2 Press and hold "SECOND HAND" button, then press the "CLOSE PRESS" button. The light should flash. When jog is complete the light will illuminate solidly.

5.7 Curing - Initial "HEAT" Oil System Start Up

5.7.1 In NGC Pump /Heater Room

5.7.1.1 Turn 480 volt "Dipole Oil Heater" breaker to the "ON" position.

5.7.1.2 Open water cooler valve MOV-L.

5.7.1.3 Open platen cooling valve MOV-M.

5.7.1.4 Open air supply valve MOV-K.

5.7.2 Outside Oil /Air Heat Exchanger Area (Behind NGC Pump /Heater Room)

5.7.2.1 Place both breakers on the Dipole Heat Exchanger to the "ON" position (red handles up).

CAUTION

Leaks from the heat exchanger have the potential to cause a regulatory violation

5.7.2.2 Inspect oil cooler for leaks before each cure. Report any leaks to the Plant Manager. If the leak has the potential to impact the environment, call extension 2222 to report it.

5.7.3 In NGC Pump /Heater Room

5.7.3.1 Locate the Dipole Oil Heater Control Box

5.7.3.2 Turn breaker handle to "RESET" position, then turn to the "ON" position.

5.7.3.3 Press both Heater "RESET" buttons.

NOTE

Low Oil Flow Alarm is expected. Clear alarm by pressing the "ACKNOWLEDGE" button on the Honeywell panel (Section 5.2.3.12).

5.8 Curing - Start AMTEX Computer

5.8.1 Boot-up computer and double-click data collection icon. Click on the "PART DESIGNATION" box. Type in coil Serial Number and click "ENTER".

5.8.2 Check that T/C & LVDT is in "AUTO".

NOTE

If error message appears and you choose not to override existing file, click "NO" on the message. To restart the program click on the arrow in the upper left hand corner and proceed as in step # 5.8.1

5.8.3 Click "CURING CYCLE START" button.

5.9 Curing - Configure Honeywell Control Box

NOTE 1

The box is located on top of the upper PATHEX Control Panel

NOTE 2

The temperature indicating controllers (TIC1, TIC2) were factory set for the proper input /output configurations. TIC-1 controls the process according to its setpoint which can be locally set or remotely set via its remote setpoint input. The setpoint for TIC-2 should be set at 120 Degrees F/ It will control the cooling source to be used: either the air exchanger (above 120 Degrees F.) or the water exchanger (below 120 Degrees F.) One cooling source will be active at all times which is verified by the blue pilot lights (B1, B2).

NOTE 3

The TIC tuning parameters should be set to match the heating process. An optimum performance level should be achieved which will allow for quick response to setpoint while minimizing overshoot. Refer to Honeywell's Digital Controller Product Manuals (UDC2000, UDC3000) for instructions regarding the tuning parameters.

5.9.1 Ensure that "TIC-1" is in the "AUTO" mode (letter "A" on the display).

5.9.2 Press "START" button. The light should illuminate.

5.9.3 Turn both heat switches to the "ON" position.

5.10 Curing - Final Configuration of PATHEX Control Panel

5.10.1 Press & hold "SECOND HAND" button, then press "PRESS PRESS MODE" button. Light should illuminate.

NOTE

Programmed mode is initiated

5.10.2 Wait for "BEGIN CURING PROCESS" button to flash (approx. 1 min.).

5.10.3 Press and hold the "SECOND HAND" button, then press "BEGIN CURING PROCESS". Light on button should illuminate.

5.10.4 Set (3) key switches to positions as noted below:

- ♦ NUMERIC KEYS LOCK to "ON"
- ♦ ZONE & MODE SELECTOR to "LOCK"
- ♦ OPERATOR CONTROL to "LOCK"

NOTE

Curing cycle is now running

5.11 Curing - While Curing Cycle is Running

DANGER

Do not enter the NGC Pump /Heater Room during the curing cycle without proper personnel protective equipment (Hot Oil Suits). If an oil leak is detected, evacuate immediately and secure the system by using the Emergency Stop buttons on both the PATHEX and Honeywell Control Panels.

5.11.1 Verify that all LVDT and thermocouple readings are providing accurate data. If any readings are suspicious, notify supervisor.

5.11.2 Verify that there are no warning lights illuminated. If any are on, notify supervisor.

5.11.3 Cure cycle will now proceed automatically until completion. Horn will sound when cycle is completed. After completion of cycle, perform Section 5.12.

NOTE

Continuous monitoring of curing cycle is not required. An operator shall remain in proximity of the press to ensure that any warning alarms are detected and resolved.

5.12 Curing - Cure Cycle Shut Down

5.12.1 On PATHEX Control

5.12.1.1 Set (3) key switches to positions as noted below:

- NUMERIC KEYS LOCK to "OFF"
- ZONE & MODE SELECTOR to "ENABLE"
- OPERATOR CONTROL to "ENABLE"

5.12.2 On Honeywell Control Panel (Located on top of upper PATHEX control panel)

5.12.2.1 Turn both heat switches to the "OFF" position.

5.12.2.2 Press "STOP" button.

5.12.3 On AMTEX Computer

5.12.3.1 Click on "STOP". End cure.

5.12.4 In NGC Pump /Heater Room

5.12.4.1 Turn 480 volt Dipole Oil Heater breaker to the "OFF" position.

5.12.4.2 Close water cooler valve MOV-L.

5.12.4.3 Close platen cooling valve MOV-M.

5.12.4.4 Close air supply valve MOV-K.

5.12.5 Outside Oil /Air Heat Exchanger Area (Behind NGC Pump /Heater Room).

5.12.5.1 Place both breakers on the Dipole Heat Exchanger to the "OFF" position (red handles down).

5.12.6 In NGC Pump /Heater Room on the Hot Oil Boiler

5.12.6.1 Turn breaker handle to the "OFF" position.

5.12.7 Curing - Jog Platen

5.12.7.1 Press and hold the "SECOND HAND" button down, then press the "PRESS JOG MODE" button. The button should illuminate.

NOTE

"AUTOMATIC MODE" button should be lit. If not, do the following:

A) Press and hold "SECOND HAND BUTTON" down.
B) Press "AUTOMATIC MODE" button. "AUTOMATIC MODE" button should illuminate.

5.12.7.2 Press and hold "SECOND HAND" button, then press the "OPEN PRESS" button. The light should flash. When jog is complete, the light will illuminate solidly.

5.13 Curing - Unloading Formblock

5.13.1 Press and hold the "SECOND HAND" button down, then press the "PRESS LOAD MODE" button. The light should illuminate.

NOTE

"AUTOMATIC MODE" button should be lit. If not, do the following:

A) Press and hold "SECOND HAND BUTTON" down.
B) Press "PRESS AUTOMATIC MODE" button. Button should illuminate.

5.13.2 Press and hold the "SECOND HAND" button down, then press the "UNLOAD CURING TOOL" button. Button should flash until the formblock has been completely unloaded from the press. When the light goes solid, the tool is fully unloaded.

5.13.3 Press the "EMERGENCY STOP" button.

5.13.4 Close Oil Valves MOV-J (located on the return line at the non-lead end of mandrel), MOV-I (main return located near the floor of the press table) and MOV-H (main supply located near the floor of the press table).

5.13.5 Install oil absorbent towels under the mandrel connections.

CAUTION

Do not let oil drip onto the coil

NOTE

If leakage is detected from the mandrel quick disconnects (located on its end), the oil shall be cleaned up immediately & disposed of as regulated industrial waste. Place quick-disconnects in secondary containment when not connected.

5.13.6 Disconnect the mandrel quick-disconnects and place in tub with oil absorbent towels.

5.13.7 Disconnect the thermocouples from the mandrel.

5.14 Curing - To Extend A Stage (Tooling not reaching Set Point Temperature)

5.14.1 Press "SECOND HAND" button and continue curing cycle (pushbutton light should flash).

5.14.2 When you reach Set Point temperature, press "SECOND HAND" button and continue curing cycle. Push button light should go solid and program should proceed to next step.

5.15 Curing - Manually Advancing to Next Stage

5.15.1 Press "SECOND HAND" button once & press "CONTINUE CURING PROCESS" button twice.

5.15.2 Program will advance to next stage.

5.16 Curing - Running In Manual Mode

5.16.1 If program is run in manual mode, the operator must respond to flashing "CONT CURING CYCLE" button at each stage of program.

5.17 Collaring - Preparation for Collaring

5.17.1 Locate LVDT blocks at (16) locations.

NOTE

Reference identification markings on LVDT blocks and mounting surface for proper location.

5.17.2 Install (2) collaring stop blocks (12010006–AF, SHT2-2) at each end of the press.

5.17.3 On the east side of the press at non-lead end only, install .005 shim under stop block. Check for debris.

5.18 Collaring - System Start-Up of PATHEX Control Panel

5.18.1 Ensure that the following (3) keys are turned to the right as follows:

- NUMERIC KEYS LOCK to "OFF"
- ZONE & MODE SELECTOR to "ENABLE"
- OPERATOR CONTROL to "ENABLE"

5.18.2 Pull "EMERGENCY STOP" up. The light on the button should be off.

5.18.3 Power up PATHEX control panel by pressing “CONTROL POWER ON" button. Light on button should illuminate.

5.18.4 Press "PRESS ZONE #4 SELECTOR" button. Button should illuminate.

5.18.5 Press “COLLARING MODE”. Button should illuminate or flash.

5.18.6 Press "F1" on keypad until “set up menu” appears.

5.18.7 Press "F2" on keypad, “process #” should appear.

5.18.8 Press the number "2" on the keypad.

5.18.9 Press “ENTER” on the keypad. Screen should now read “process #2".

5.18.10 Press "F2" on the keypad. “recipe #” should appear.

5.18.11 Press the number "2" on keypad.

5.18.12 Press “ENTER” on the keypad. Screen should read “recipe #2”.

5.18.13 Moving from left to right, press the following buttons:

- "HYD OIL CIRC START"
- "HYD LOW PRESSURE START"
- "HYD HIGH PRESSURE START"

NOTE

Not all lights will remain lit.

5.18.14 Press and hold the "SECOND HAND" button down, then press the "PRESS LOAD MODE" button. Light on "PRESS LOAD MODE" should illuminate.

CAUTION

Be sure all personnel are clear of press and collaring table

5.19 Collaring - Loading Cold Mass

5.19.1 Press and hold the "SECOND HAND" button down, then press the “PRESS AUTOMATIC MODE” button. Button should flash.

5.19.2 Press and hold the "SECOND HAND" button down, then press the "LOAD COLLARING TOOL" button. Load collaring tool button should flash until the cold mass has been completely loaded into the press. When the light goes solid the tool is fully loaded.

5.20 Collaring - Starting AMTEX Computer

5.20.1 Flip switch on U.P.S. (un-interruptible power supply) to the “on” position. Turn on computer.

5.20.2 Wait for computer to boot-up.

5.20.3 Double click "DATA COLLECTION". Enter coil /magnet number. Click "ENTER".

5.20.4 Click on "COLLARING START" button.

5.21 Collaring - Jog Platen

5.21.1 Press and hold the "SECOND HAND" button down, then press the “PRESS JOG MODE” button. Button should illuminate.

NOTE

"AUTOMATIC MODE" button should be lit. If not, perform the following steps:

A) Press and hold "SECOND HAND BUTTON" down
B) Press "AUTOMATIC MODE" button. Button should illuminate.

5.21.2 Press and hold "SECOND HAND" button, then press the "CLOSE PRESS" button. The light should flash. When jog is complete the light will illuminate solidly.

5.21.3 Press and hold "SECOND HAND" button, then press "PRESS PRESS MODE" (PROGRAMMED) button. Light should illuminate.

5.21.4 Wait for "BEGIN COLLARING PROCESS" button to flash (approximately 1 minute).

5.21.5 Press and hold "SECOND HAND" button, then PRESS "BEGIN COLLARING PROCESS" button (RAM pressure should rise to 250 PSI). When pressure is reached "CONTINUE COLLAR" button will flash.

5.21.6 On AMTEX computer move mouse to "ACQUIRE DATA" and click left mouse button

5.22 Collaring - Collaring Cycle

5.22.1 After data is acquired press and hold "SECOND HAND" button and press "CONTINUE COLLAR" button (pressure will go up in 200 PSI intervals). After each pressure bump, "CONTINUE COLLAR" button will flash. Before continuing, "ACQUIRE DATA" on AMTEX monitor must be pressed before continuing.

5.22.2 Verify that LVDT'S are within .004" from side to side.

5.22.3 Continue collar process until a keyway opening of .300" is achieved. If keyway of .300" is not reached by a maximum pressure of 4350 PSI or minimum of 3116 PSI, contact supervisor.

NOTE

If the collaring process needs to be aborted, switch press mode selector to "JOG" and press the "SECOND HAND" button (pressure will drop to zero).

5.23 Collaring - Key Insertion

CAUTION

Do not work in the press on the cold mass until the "OPERATOR CONTROL" selector switch is locked.

5.23.1 Switch keyed "OPERATOR CONTROL" selector switch to lock and remove key. This prevent accidental operation.

5.24 Collaring - Completing Collaring Operation

5.24.1 Press "STOP" collaring on computer.

5.24.2 Switch the "OPERATOR CONTROL" selector switch to "ENABLE". Depress the “SECOND-HAND” button and the “PRESS JOG MODE” button (button will illuminate) to exit program mode.

5.24.3 Depress the “SECOND HAND” button and “OPEN PRESS” button. Light will flash until press is fully open.

5.25 Collaring - Unload Press

CAUTION

Be sure all personnel are clear of press and collaring table.

5.25.1 Press “SECOND HAND” button and “PRESS LOAD MODE” button.

5.25.2 Press “SECOND HAND BUTTON” and “UNLOAD COLLARING TOOL”.

5.26 Miscellaneous Troubleshooting

5.26.1 "Control Power" Does Not Turn "ON"

5.26.1.1 One of the emergency cable pull switches are activated. Reset switch light should turn off, if not, the switch will need to be adjusted or replaced.

5.26.2 Curing and Collaring Tables Do Not Work

5.26.2.1 Be sure to select collaring or curing mode (press pushbutton).

5.26.2.2 Press yellow drive RESET pushbutton located in hydraulic power cabinet.

5.26.3 Low Oil Level Alarm

CAUTION

Unexplained low oil level or need to refill system may be an indication of a system leak (oil to water). Notify the Environmental Compliance Representative or ES&H Coordinator prior to returning the system into service.

5.26.3.1 Be sure there are no leaks.

5.26.3.2 Expansion tank oil level must be 1.0" from the bottom of upper sight glass.

NOTE

Do not overfill

5.26.4 Low Oil Flow Alarm

NOTE

Alarm will sound when flow is less than 14-22 GPM

5.26.5 "Press Press Mode" Does Not Turn On

5.26.5.1 Press the two heater "RESET" pushbuttons on the Dipole Oil Heater Control Box

5.27 Creating Programs

5.27.1 Press "F1" until "SET UP MENU" appears.

5.27.2 Press "F2". "Process #" should appear.

5.27.3 Enter "1" for Curing, or (2) for Collaring.

5.27.4 Press "F2". "Recipe #" should appear.

5.27.5 Enter correct recipe # to be used or programmed.

5.27.6 Press "F2" to open recipe, starting with Stage #1.

5.27.7 Use "F5" & "F6" to scroll through inputs - Enter each input and then advance to next input using "F6".

Parameters

Cycle	Stage#	Command	Description
BMP	1	TON	=Duration of 1st Stage Bump (Seconds)
BMP	1	TOF	=Duration of No Pressure 1st Stage Bump (Seconds)
BMP	1	R.P.	=Ram Pressure of 1st Stage Bump
BMP	1	P.P.	=End Pusher Pressure of 1st Stage Bump
BMP	1	QTY	= # of bumps (cycles) in 1st Stage
BMP	1	TEM	=Target Temperature at end of 1st Stage

5.27.8 Press "F2" when done programming Stage 1. "Set up Stage 2" will appear.

NOTE 1

Bump Quantity must be at least 1

5.27.9 Function Keys:

- "F3": Opens alarm monitoring sub-menu.
- "F4": Opens system monitoring sub-menu.
- "F5" & "F6": Scroll thru sub-menus.

5.28 Calibration of the Main Vertical and the End Pressure Measurement System

NOTE 1

The calibration of the Main Vertical Pressure Measurement System and the calibration of the End Pressure Measurement System are to be performed separately and recorded on individual Calibration Reports. In each case, the procedure described in this section shall be used to perform these calibrations.

NOTE 2

The Calibration Technician is responsible for performing the main actions of the calibration procedure.

The Operator is responsible for those parts of the procedure involving manipulation of the controls of the NGC Curing Press and operations to the hydraulic pressure lines.

The Division Calibration Group is responsible for:

- **Maintaining a list of Authorized Calibration Technicians**
- **Notifying responsible persons when calibrations are due**
- **Affixing appropriate labels and stickers indicating calibration status**
- **Maintaining a file for all documents related to calibrations**

NOTE 3

You must be listed as an Authorized Calibration Technician before using this procedure. A current list is available in the Superconductor Magnet Division Calibration Group Office.

NOTE 4

You must be listed as an Authorized Operator for the NGC Curing Press before performing the sections of the Calibration Procedure designated to be performed by the "Operator". A current list is available from the Cognizant Technical Supervisor for the NGC Curing Press. All applicable steps and precautions in this OPM regarding operation of the Curing Press shall be followed during calibration.

NOTE 5

Required Tools & Equipment:

- **Calibrated dead weight tester capable of applying 3000 PSI.**
- **Safety glasses with side shields, or goggles.**

NOTE 6

In this section, the tasks designated to be performed by the Authorized Operator, the Authorized Calibration Technician, and the Calibration Group Representative are indicated by the headings "Operator", "Calibration Technician", and "Calibration Group Representative".

NOTE 7

The "ID numbers" referred to are hand written on white labels affixed to an easily visible surface of the equipment. In the absence of a label, the serial number or barcode of the equipment may be used as an ID number.

NOTE 8

Calibration frequency is Six Months.

NOTE 9

Ensure all oil is cleaned up and disposed of properly

Operator

WARNING

Disturbing a hydraulic line while it is pressurized could cause injury.

5.28.1 Verify that all hydraulic lines on the Press are depressurized.

5.28.2 Disconnect the 4-20 mA (Barksdale) Pressure Transducer from the Main or End Pressure hydraulic line (depending on which system is being calibrated). Install a temporary cap on the hydraulic line pressure fitting.

WARNING

Pressures up to 3000 PSI are applied to the transducers during the procedure. Failure to use proper high-pressure fittings could result in severe injury.

5.28.3 Attach the Pressure Reference (Dead Weight Tester) to the Pressure Transducer input.

WARNING

Use caution when energizing the control console. Failure to follow step 5.15.4 could result in injury or equipment damage.

5.28.4 Verify that energizing the PATHEX (curing press) Control Panel will not result in energizing of pumps, heaters or other equipment not intended to be energized by placing the following key switches to the "LOCK" position and removing them from the panel after the panel has been energized (see sections 5.4.1, 5.4.2 and 5.4.3):

A) Zone & Mode Selector
B) Operator Control

5.28.5 Energize the Curing Press control console, and the computerized data acquisition system, by following the applicable steps in this procedure.

Calibration Technician

5.28.6 Record the following ID #'s on the Calibration Report (Attachment 5):

A) Hydraulic Pressure Transducer.

B) Pressure Indicator (located on the control console) associated with the Pressure Transducer.

C) Pressure Reference.

5.28.7 Apply the test pressures called out in the "Applied Input" column of the Calibration Report (Attachment 5). DO NOT adjust anything before all first run data has been recorded.

5.28.8 In the "Before Adjustment" section of the Calibration Report, at each test point, record the following data:

A) Pressure Transducer voltage output in the "Output Voltage" column.

B) Pressure Indicator reading in the "Read (console indicator)" column.

C) Pressure as displayed on the computer monitor at the "Main Pressure" box heading in the "Read (computer monitor)" column.

5.28.9 Select the appropriate case and continue as directed:

Case 1: All of the readings are within the Specified Tolerance of ±50 psi of the Applied Input. No adjustments will be made. Go To paragraph 5.28.10.

Case 2: All of the readings are within the Specified Tolerance of ±50 psi. You will make adjustments to the system because you have judged that the accuracy of the system may be further improved. Go To section 5.28.11.

Case 3: Some or all of the readings are outside of the Specified Tolerance of ±50 psi. Go To section 5.28.12.

5.28.10 Case 1: Complete the following steps 5.28.10.1-5.28.10.3

Calibration Group Representative

5.28.10.1 Place a calibration sticker on the Pressure Indicator.

5.28.10.2 Complete, date, and sign the Calibration Report. Provide a copy to the Calibration Group. This completes the calibration.

Operator

5.28.10.3 Remove the Pressure Transducer from the Pressure Reference and re-install it onto the Main Pressure hydraulic line.

5.28.11 Case 2: Complete the following steps 5.28.11.1-5.28.11.6.

Calibration Technician

5.28.11.1 Make appropriate adjustments to the system.

5.28.11.2 Re-apply the test pressures called out in the "Applied Input" column of the Calibration Report.

5.28.11.3 When the best possible accuracy has been attained, record the final run of data in the two "Read" columns of the "After Adjustment" section.

Calibration Group Representative

5.28.11.4 Place a calibration sticker on the Pressure Indicator.

5.28.11.5 Complete, date, and sign the Calibration Report. Provide a copy to the Calibration group. This completes the calibration.

Operator

5.28.11.6 Remove the Pressure Transducer from the Pressure Reference and re-install it onto the End or Main Pressure hydraulic line (depending on which system is being calibrated).

5.28.12 Case 3: Complete the following steps 5.28.12.1-5.28.12.4

Calibration Technician

5.28.12.1 Place a "*" in the "Fail" column next to the reading(s) that are outside the Specified Tolerance.

5.28.12.2 Adjust and re-check the system as necessary until the best possible accuracy has been attained.

5.28.12.3 If the system can be adjusted to within the Specified Tolerance, then record the final run data in the "Read" columns in the "After Adjustment" section and perform the following steps A, B, C:

Calibration Group Representative

A) Place a calibration sticker on the Pressure Indicator.

B) Complete, date, and sign the Calibration Report. Provide a copy to the Calibration Group.

Operator

A) Remove the Pressure Transducer from the Pressure Reference and re-install it onto the Main Pressure hydraulic line.

5.28.12.4 IF the system can not be adjusted to within the Specified Tolerance, perform the following steps A, B, C, D:

A) The Calibration Technician shall notify the Cognizant Technical Supervisor and the Cognizant Engineer immediately.

Calibration Group Representative

B) Place a "DEFECTIVE" label in a prominent location on the system.

Operator

C) Take appropriate steps to resolve the problem and restore the system to working order.

Calibration Technician

D) Complete, date, and sign the Calibration Report. Provide a copy to the Calibration Group.

5.29 Calibration of the Temperature Monitoring System

NOTE 1

The Calibration Technician is responsible for performing the main actions of the calibration procedure.

The Operator is responsible for those parts of the procedure involving manipulation of the controls of the NGC Curing Press and operations to the hydraulic pressure lines.

The Division Calibration Group is responsible for:

- **Maintaining a list of Authorized Calibration Technicians**
- **Notifying responsible persons when calibrations are due**
- **Affixing appropriate labels and stickers indicating calibration status**
- **Maintaining a file for all documents related to calibrations**

NOTE 2

You must be listed as an Authorized Calibration Technician before using this procedure. A current list is available in the Superconductor Magnet Division Calibration Group Office.

NOTE 3

You must be listed as an Authorized Operator for the NGC Curing Press before performing the sections of the Calibration Procedure designated to be performed by the "Operator". A current list is available from the Cognizant Technical Supervisor for the NGC Curing Press. All applicable steps and precautions in this OPM regarding operation of the Curing Press shall be followed during calibration.

NOTE 4

Required Tools & Equipment:

- **Calibrated glass thermometer with a range of 0-100^{0}C. and graduations of 0.5^{0}C or smaller.**
- **1500ml Pyrex Beaker**
- **Hot Plate**
- **Crushed Ice**
- **Thermometer clamp**
- **Test Stand**
- **Safety glasses with side shields, or goggles.**

NOTE 5

In this section, the tasks designated to be performed by the Authorized Operator, the Authorized Calibration Technician, and the Calibration Group Representative are indicated by the headings "Operator", "Calibration Technician", and "Calibration Group Representative".

NOTE 6

The "ID numbers" referred to are hand written on white labels affixed to an easily visible surface of the equipment. In the absence of a label, the serial number or barcode of the equipment may be used as an ID number.

NOTE 7

Calibration frequency is Six Months.

NOTE 8

The Thermocouples and the Temperature Indicators are not adjustable

Operator

5.29.1 Verify that the Temperature Indicators and the data acquisition system are energized. The Indicators and the computer monitor should display room temperature.

Calibration Technician:

5.29.2 Record the following ID #'s on the Calibration Report (Attachment 6).

A) Temperature Reference (calibrated glass thermometer).

B) Two Temperature Indicators (Omega model 115JC thermocouple readouts located on the Curing Press Control Console).

5.29.3 Set up the test stand on a rolling cart.

5.29.4 Prepare a beaker of water (tap or distilled) and crushed ice. Place the beaker on the test stand.

5.29.5 Clamp the thermometer onto the test stand using the thermometer clamp.

5.29.6 Place the thermometer in the beaker of water without allowing it to touch the sides of the beaker. For "immersion" type thermometers, the thermometer must be immersed up to the indicator line on the thermometer.

5.29.7 Roll the cart to the thermocouple to be tested.

5.29.8 Detach the thermocouple from the formblock/mandrel.

NOTE

Two thermocouples are found at each location. One thermocouple is connected to the Temperature Indicator on the console; the other is

connected to the data acquisition system and is read on the computer display. Both thermocouples must be tested.

5.29.9 Find the correct row on the Calibration Report Test Data section that matches the thermocouple ID number.

5.29.10 If the thermocouple is connected to the console Temperature Indicator, then perform 5.28.10.1.

Operator

5.29.10.1 Turn the selector switch on the control console so that the thermocouple under test is connected to the Temperature Indicator.

Calibration Technician

5.29.11 Insert the thermocouple in the ice/water mixture while stirring the mixture.

5.29.12 Record the thermometer reading in the "Actual (ice bath)" column.

5.29.13 If the thermocouple is connected to the console Temperature Indicator, then record the reading displayed on the Temperature Indicator in the "Read (console indicator)" column.

5.29.14 If the thermocouple is connected to the data acquisition system, then record the reading displayed on the computer monitor in the "Read (computer monitor)" column.

5.29.15 Place a "*" in the "Fail" column if a reading is outside of the Specified Tolerance of $\pm 2^0$C of the "Actual" temperature.

5.29.16 Do not re-attach the thermocouple to the formblock/mandrel at this time.

5.29.17 Repeat steps 5.28.7 to 5.28.16 for all of the thermocouples to be tested.

5.29.18 Dismantle the test set-up.

WARNING 1

The remainder of the procedure involves working with boiling water in a beaker. Failure to wear eye protection during this part of the procedure could result in injury.

WARNING 2

Normal care must be exercised when working with hot materials. Be especially careful when moving the cart so that items on the cart do not tip over. Get help if you are not able to maneuver the cart easily.

WARNING 3

To avoid spilling hot water, do not overfill the beaker.

5.29.19 Fill the beaker no more than 2/3 full of water (tap or distilled).

5.29.20 Sets up the hot plate on the cart with an extension cord long enough to allow the cart to reach all of the thermocouples.

5.29.21 Place the filled beaker on the hot plate and turn on the hot plate.

5.29.22 Clamp the thermometer onto the test stand using the thermometer clamp.

5.29.23 Place the thermometer in the beaker of water without allowing it to touch the sides of the beaker. For "immersion" type thermometers, the thermometer must be immersed up to the indicator line on the thermometer.

5.29.24 Roll the cart to the thermocouple to be tested.

5.29.25 Note the thermocouple ID number so that subsequent data is recorded in the proper row on the Calibration Report.

5.29.26 Insert the thermocouple into the boiling water.

5.29.27 Record the thermometer reading in the "Actual (boiling water)" column.

5.29.28 If the thermocouple is connected to the console Temperature Indicator, the record the reading displayed on the Temperature Indicator in the "Read (console indicator)" column.

5.29.29 If the thermocouple is connected to the data acquisition system, the record the reading displayed on the computer monitor in the "Read (computer monitor)" column.

5.29.30 Place a "*" in the "Fail" column if a reading is outside of the Specified Tolerance of ±2 ^{0}C of the "Actual" temperature.

5.29.31 Re-attach the thermocouple to the formblock/mandrel.

5.29.32 Repeat steps 5.28.24 to 5.28.31 for all of the thermocouples to be tested.

5.29.33 Dismantle the test set-up.

5.29.34 If all of the readings are within the Specified Tolerance of ±2 ^{0}C, then the *Calibration Group Representative* shall place a calibration sticker on the Temperature Indicator on the control console.

5.29.35 If one or more readings are outside the Specified Tolerance of ±2^{0}C, then the *Calibration Technician* shall notify the Cognizant Technical Supervisor and the Cognizant Engineer immediately. Also perform the following two steps A & B:

Calibration Group Representative

A) Place a "DEFECTIVE" Label on the Temperature Indicator or on the data acquisition system in a prominent location.

Operator

B) Take appropriate steps to resolve the problem and restore the system to working order.

Calibration Technician

5.29.36 Complete, date, and sign the Calibration Report. Provide a copy to the Calibration Group.

5.30 Changing LVDT Offset

5.30.1 Bring up windows main screen.

5.30.2 Click on the following selections:

A) "START"
B) "PROGRAMS
C) "NATIONAL INSTRUMENTS LABVIEW"
D) "LABVIEW"

5.30.3 Select "OPEN VI"

5.30.4 Scroll to right and double-click "RHIC16"

5.30.5 Double-click "DATRONICS DATA PARSER"

5.30.6 In either curing or collaring box, make changes (Hit ENTER after each change).

5.30.7 On top bar, click "OPERATE".

5.30.8 Click "MAKE CURRENT VALUES DEFAULT"

5.30.9 On top bar, click "FILE".

5.30.10 Click "SAVE".

5.30.11 To start data collection, double click.

5.30.12 Enter /Start curing cycle.

5.31 Emergency Stop Test Procedure

NOTE

The test shall be completed at an interval not to exceed 6 months

5.31.1 Oil Heater "HEAT" System

5.31.1.1 Perform initial start up of the "HEAT", hydraulic, control panel, boiler controller and heat exchanger systems as noted in sections 5.3 & 5.4 & 5.7.

WARNING

The next step will require the operator to enter the NGC Pump /Heater Room. Personnel protective equipment (Hot Oil Suit) is required prior to entering the room during this test.

5.31.1.2 On the Dipole Boiler Control Panel, press the E-STOP button. Verify that the following two events have occurred:

- Hot Oil pump has stopped.
- Two RH Amp Draw meters on the boiler control panel have gone to zero.

5.31.1.3 If both events occur, check the appropriate box on the Emergency Stop Test Form (attachment 8). If either of the events fails to occur, write "fail" on the form, notify the Cognizant Engineer, Technical Supervisor, and the ES&H Coordinator.

NOTE

The next 3 steps will require a second operator to complete.

5.31.1.4 Restart the "HEAT" System by resetting the circuit breaker and pressing both heater element reset buttons on the Boiler Control Panel.

5.31.1.5 While the suited operator remains in the NGC Pump /Heater Room, the 2nd operator shall press the E-STOP button on the Honeywell Control Panel. The operator in the pump /heater room will then verify that the following two events have occurred:

- Hot Oil pump has stopped.
- Two RH Amp Draw meters on the boiler control panel have gone to zero.

5.31.1.6 If both events occur, check the appropriate box on the Emergency Stop Test Form (attachment 8). If either of the events fails to occur, write "fail" on the form, notify the Cognizant Engineer, Technical Supervisor, and the ES&H Coordinator. Do not use the press until the situation is corrected.

5.31.2 Motor System - Curing Bed

5.31.2.1 Restart the hydraulic system and control panel as noted in sections 5.3 & 5.4. The "HEAT" system will not need to be restarted.

5.31.2.2 Initiate movement of the curing formblock into the press. Refer to Sections 5.5.1-5.5.3.

5.31.2.3 While the table is moving, pull the emergency stop cord identified as "A" on attachment 8.

5.31.2.4 Verify that the table has stopped moving. If it does, check the appropriate box on the Emergency Stop Test Form (attachment 8). If the table fails to stop, write

"fail" on the form, notify the Cognizant Engineer, Technical Supervisor, and the ES&H Coordinator. Do not use the press until the situation is corrected.

5.31.2.5 Reset the emergency cord stop by pushing the blue button on the appropriate Emergency Stop Cord panel.

5.31.2.6 Press the CONTROL POWER ON button on the upper PATHEX control panel.

5.31.2.7 Repeat 5.31.2.2-5.31.2.6 for emergency stop cords "B" thru "F".

5.31.2.8 Initiate movement of the curing formblock into the press. Refer to Sections 5.5.1-5.5.3.

5.31.2.9 Press the E-STOP button on the lower PATHEX control panel.

5.31.2.10 Verify that the table has stopped moving. If it does, check the appropriate box on the Emergency Stop Test Form (attachment 8). If the table fails to stop, write "fail" on the form, notify the Cognizant Engineer, Technical Supervisor, and the ES&H Coordinator. Do not use the press until the situation is corrected.

5.31.2.11 Reset the emergency stop by pulling up the E-STOP button on the lower PATHEX control panel. Press the CONTROL POWER ON button on the upper PATHEX control panel.

5.31.2.12 Repeat 5.31.2.8-5.31.2.11 for the E-STOP button on the Dipole Press Controller.

5.31.3 Motor System - Collaring Bed

5.31.3.1 Perform section 5.31.2 in its entirety on the collaring bed employing the following exceptions.

CAUTION

Performing these steps without the Stop Blocks in place may result in damage to the platen hydraulic cylinders

A) Use section 5.19 in place of 5.5.1-5.5.3 for instruction on moving bed into press.
B) Verify that Stop Blocks are in place prior to starting.

5.31.4 Hydraulic System

CAUTION

This section shall be performed with the "HEAT" system off.

NOTE

The next 10 steps will require a second operator to complete.

5.31.4.1 The 1st operator will be positioned at the press. The 2nd operator will be positioned inside the NGC Pump /Heater Room.

5.31.4.2 *1st Operator* With the hydraulic system activated per section 5.3 & 5.4, pull the emergency stop cord identified as "A" on attachment 8.

5.31.4.3 *2nd Operator* Verify that the hydraulic pump has stopped. If it does, check the appropriate box on the Emergency Stop Test Form (attachment 8). If the pump fails to stop, write "fail" on the form, notify the Cognizant Engineer, Technical Supervisor, and the ES&H Coordinator. Do not use the press until the situation is corrected.

5.31.4.4 *1st Operator* Reset the emergency cord stop by pushing the blue button on the appropriate Emergency Stop Cord panel.

5.31.4.5 *1st Operator* Press the CONTROL POWER ON button on the upper PATHEX control panel.

5.31.4.6 Repeat 5.31.4.2-5.31.4.5 for emergency stop cords "B" thru "F".

5.31.4.7 *1st Operator* Press the E-STOP button on the lower PATHEX control panel.

5.31.4.8 *2nd Operator* Verify that the hydraulic pump has stopped. If it does, check the appropriate box on the Emergency Stop Test Form (attachment 8). If the pump fails to stop, write "fail" on the form, notify the Cognizant Engineer, Technical Supervisor, and the ES&H Coordinator. Do not use the press until the situation is corrected.

5.31.4.9 *1st Operator* Reset the emergency stop by pulling up the E-STOP button on the lower PATHEX control panel. Press the CONTROL POWER ON button on the upper PATHEX control panel.

5.31.4.10 Repeat 5.31.4.7-5.31.4.9 for the E-STOP button on the Dipole Press Controller.

6 Documentation

6.1 Coil Curing Press Log Book

6.2 Magnet Travelers.

6.3 Maintenance Log.

6.4 Magnet Assembly Procedure

6.5 Calibration Report

6.6 Emergency Stop Test Form

6.7 MOV Checklist

7 References

7.1 BNL ES & H Manual 1.5.1, “Lockout/Tagout Requirements”.

7.2 BNL ES & H Manual 1.5.0, “Electrical Safety”.

8 Attachments

1. PATHEX Control Panels
2. Honeywell Control Panel and AMTEX Computer
3. "HEAT" NGC Pump /Heater Room Control Panel
4. "HEAT" Quad & Dipole Heat Exchangers
5. Calibration Report: Main & End Vertical Hydraulic Pressure Measurement System
6. Calibration Report: Temperature Monitoring System
7. Manually Operated Valve Checklists
8. Emergency Stop Test Form
9. HEAT System Alarm Conditions
10. PATHEX Computer Trouble Shooting Procedure

Attachment 1 - PATHEX Control Panels

Upper Panel

Lower Panel

Attachment 2 - Honeywell Controller & AMTEX Computer

Honeywell

AMTEX

Attachment 3 - "HEAT" Boiler Controller

DIPOLE

Attachment 4 - "HEAT" System Heat Exchangers

One of two units in Oil /Air Heat Exchanger Area

Attachment 5 - Calibration Report: Main Vertical & End Hydraulic Pressure Measurement

SUPERCONDUCTOR MAGNET DIVISION CALIBRATION GROUP

CALIBRATION REPORT No._____

Title: NGC Curing Press--Main Vertical & End Hydraulic Pressure Measurement System

This Report is for (✔): Main Vertical Pressure Measurement End Pressure Measurement

Service Date_____ By_____

==========

THIS ASSET WAS CALIBRATED USING TEST EQUIPMENT WHOSE ACCURACY IS TRACEABLE TO THE NIST, OR ACCEPTED VALUES OF NATURAL PHYSICAL CONSTANTS.

==========

TEST DATA

Pressure Transducer: ID#_____

Pressure Indicator: ID#_____

Pressure Test Reference: ID#_____

			Before Adjustment			After Adjustment		
Specified Tolerance	Applied Input (psi)	Transducer Output Voltage	Read console indicator	Read computer monitor	Fail (*)	Read console indicator	Read computer monitor	Fail (*)
±50 psi (all readings)	0							
	500							
	1000							
	1500							
	2000							
	2500							
	3000							
	2500							
	2000							
	1500							
	1000							
	500							
	0							

Calibration Date: Calibration Due:

_____

Service Notes

Attachment 6 - Calibration Report: Temperature Monitoring System

SUPERCONDUCTOR MAGNET DIVISION CALIBRATION GROUP: CALIBRATION REPORT No. ____

Title: NGC Curing Press--Temperature Monitoring System

Service Date_____ By_____

==========

THIS ASSET WAS CALIBRATED USING TEST EQUIPMENT WHOSE ACCURACY IS TRACEABLE TO THE NIST, OR ACCEPTED VALUES OF NATURAL PHYSICAL CONSTANTS.

==========

TEST DATA

Temperature Reference: ID#_____

Specified Tolerance: ±2 ^{0}C of "Actual" temperature (all readings)

T/C#	Thermocouple Position	Actual (ice bath)	Read console indicator	Read computer monitor	Fail (*)	Actual (boiling water)	Read console indicator	Read computer monitor	Fail (*)
F1L	FIXTURE LEFT								
F2L	"								
F3L	"								
F4L	"								
F5L	'								
F1R	FIXTURE RIGHT								
F2R	"								
F3R	"								
F4R	"								
F5R	"								
M1L	MANDREL LEFT								
M2L	"								
M3L	"								
M4R	MANDREL RIGHT								
M5R	"								
M6R	"								

Calibration Date: Calibration Due:

Attachment 7

Manually Operated Valve Check List

For Normal Operation

Hot oil heating/cooling system safety check:

There are several manually operated valves in the heating/cooling system pump room that must be in the proper operating position during the curing cycle. These valves are labeled. The following check off list must be completed prior to operating the system to assure the valves are in the proper positions. The valve is in the "open" position when the handle is in line with the system transfer line.

Valve #	Position	Check Off
MOV-A	Open	_____
MOV-B	Open	_____
MOV-C	Open	_____
MOV-D	Closed	_____
MOV-E	Closed	_____
MOV-F	Closed	_____
MOV-G	1/2 Open (do not adjust)	_____
MOV-H (on floor near formblock table)	Open	_____
MOV-I (on floor near formblock table)	Open	_____
MOV-J (by formblock)	Open	_____
MOV-K	Open	_____
MOV-L	Open	_____
MOV-M	Open	_____

Above work done by:

_____

Name Date Life #

Comments: _____

_____

Manually Operated Valve Check List (Attachment 7 cont'd)

FOR PURGING OF SYSTEM ONLY

Hot oil heating/cooling system safety check:

There are several manually operated valves in the heating/cooling system pump room that must be in the proper operating position during purging of the heating/cooling oil. These valves are labeled. The following check off list must be completed prior to operating the system to assure the valves are in the proper positions. The valve is in the "open" position when the handle is in line with the system transfer line.

Valve #	Position	Check Off
MOV A	Open	_____
MOV B	Open	_____
MOV C	Closed	_____
MOV D	Closed	_____
MOV E	Open	_____
MOV F	Closed	_____
MOV G	1/2 Open (do not adjust)	_____
MOV-H (on floor near formblock table)	Open	_____
MOV-I (on floor near formblock table)	Open	_____
MOV-J (by formblock)	Open	_____
MOV-K	Open	_____
MOV-L	Open	_____
MOV-M	Open	_____

Above work done by:

_____

Name Date Life #

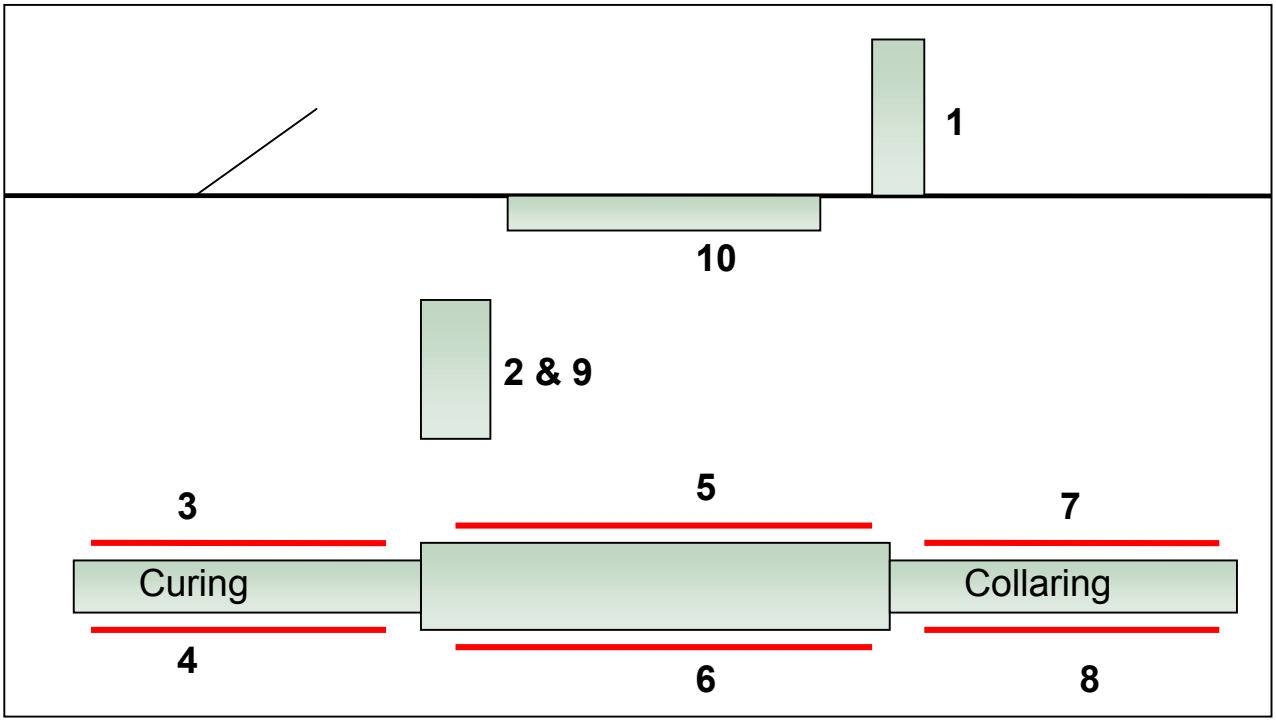
Comments: _____

_____

Attachment 8 - Emergency Stop Test Form

	Emergency Stop	"HEAT" System	Motor System *Curing*	Motor System *Collaring*	Hydraulic System
1	Dipole "HEAT" Panel				
2	Honeywell "HEAT" Panel				
3	Cord "A"				
4	Cord "B"				
5	Cord "C"				
6	Cord "D"				
7	Cord "E"				
8	Cord "F"				
9	Lower PATHEX				
10	Dipole Press Controller				

Name: _____ **Life:** _____ **Date:** _____



Attachment 9 - HEAT System Alarm Conditions

1. The following conditions cause the pump to shut off.

- The "PUMP STOP" button (PB-6) is pressed.
- The thermal overloads (OL) of the motor starter (1M) trip. The overloads may be reset by pressing the reset lever on the motor starter inside the control box only after the condition has returned to normal.
- The low level switch trips on low oil level in the expansion tank. The alarm panel will notify this condition by energizing the horn and alarm light.

2. The following conditions cause the heater to shut off.

- The pump is de-energized for any reason.
- A high temperature switch (TSH) is tripped. Reset the switch by pressing the proper "RESET" pushbutton only after the temperature has returned to normal. The alarm panel will verify this condition.
- The differential pressure switch is tripped. This signifies low oil flow through the heaters. The alarm panel will show this condition.
- The SCR heat sink thermostat is tripped, which will also trip the alarm panel.
- The current unbalance switch is tripped, which signifies an unbalanced load. The alarm panel will verify this condition.
- A heater selector switch is turned to the "OFF" position.

Attachment 10 - PATHEX Computer Trouble Shooting Procedure

1 Make Sure That Control Power Is On

1.1 Check if "CONTROL POWER" indicator is ON.

1.2 Check if all PLC cards are active (green LED at each card is ON).

1.3 Check if all proportional amplifier cards are active (green LED's are ON).

1.4 Verify that all fuses are intact.

2 Check for Alarm Messages

2.1 Depress function key "F3" to get sub-menu "MONITOR ALARM" at Allen-Bradley Panel 2705.

2.2 Check status of messages using functional keys "F5" and "F6" to scroll them.

2.3 If any alarm messages has been detected, make proper adjustment at the system and depress "ALARM / RESET" push button.

3 In Cases When Press Does Not Provide Required Sequence Of Operation

3.1 Get PC connected to Data Highway Plus of PLC.

3.2 Activate data monitor screen at 6200 PLC 5 software.

3.3 Assign 0 data in data file corresponded to proportional valves. Check value of DC voltage at test terminal Z 28 of amplifier card. Compare that value with value recommended by BOSH manufacturer.

3.4 Assign 4095 data in data file corresponded to proportional valves and repeat step 3.3.

3.5 Start circulation and high pressure pumps. Activate "JOG" mode on the press and depress two push buttons "SECOND HAND" and "CLOSE PRESS".

3.6 Check pressure set point at proportional valve of the high pressure pump and proportional relief valve. Make sure that named parameters are in the ratio called by chart of sequence of operation provided by PATHEX. Use manual.

3.7 Repeat step 3.6 at down stroke operation using "JOG" mode and "SECOND HAND", "OPEN PRESS" push buttons on the press.

3.8 Check sequence of operation of directional valves according to PATHEX chart.

3.9 If procedure recommended in 3.1-3.8 does not eliminate problems. Follow trouble shooting procedure for mechanical parts of the press.